SGS-THOMSON MICROELECTRONICS

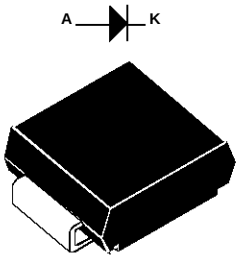
STTA206S

TURBOSWITCH ™ "A". ULTRA-FAST HIGH VOLTAGE DIODE

PRELIMINARY DATASHEET

MAIN PRODUCTS CHARACTERISTICS

$I_{F(AV)}$	**2A**
V_{RRM}	**600V**
t_{rr} (typ)	**20ns**
V_F (max)	**1.5V**



SOD15
(Plastic)

FEATURES AND BENEFITS

- SPECIFIC TO "FREEWHEEL MODE" OPERATIONS : FREEWHEEL OR BOOSTER DIODE
- ULTRA-FAST AND SOFT RECOVERY
- VERY LOW OVERALL POWER LOSSES IN BOTH THE DIODE AND THE COMPANION TRANSISTOR
- HIGH FREQUENCY OPERATIONS
- SURFACE MOUNT DEVICE

DESCRIPTION

The TURBOSWITCH is a very high performance series of ultra-fast high voltage power diodes from 600V to 1200V.
TURBOSWITCH "A" family drastically cuts losses in both the diode and the associated switching IGBT or MOSFET in all "Freewheel Mode" operations and is particulary suitable and efficient in Motor Control Freewheel applications and in Booster diode applications in Power Factor Control circuitries.

Packaged in SOD15 surface mount envelope, these 600V devices are particularly intended for use on 240V domestic mains.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	600	V
V_{RSM}	Non Repetitive Peak Reverse Voltage	600	V
$I_{F(RMS)}$	RMS Forward Current	8	A
I_{FRM}	Repetitive Peak Forward Current (tp = 5 µs, f = 5kHz)	50	A
T_j	Max. Operating Junction Temperature	125	°C
T_{stg}	Storage Temperature range	- 65 to + 150	°C

TM : TURBOSWITCH is a trademark of SGS-THOMSON Microelectronics

THERMAL AND POWER DATA

Symbol	Parameter	Conditions	Value	Unit
$R_{th(j-l)}$	Junction to Lead Thermal Resistance		21	°C/W
P_1	Conduction Power Dissipation (see fig. 2)	$I_{F(AV)}$ = 1.5A δ = 0.5 Tlead= 72°C	2.5	W
P_{max}	Total Power Dissipation Pmax = P1 + P3 (P3 = 10% P1)	Tlead= 67°C	2.8	W

STATIC ELECTRICAL CHARACTERISTICS (see Fig. 2)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_F *	Forward Voltage Drop	I_F = 2A	Tj = 25°C Tj = 125°C		 1.1	1.75 1.5	V
I_R **	Reverse Leakage Current	V_R = 0.8 x V_{RRM}	Tj = 25°C Tj = 125°C		 400	20 1200	µA

Test pulses widths : * tp = 380 µs, duty cycle < 2%
** tp = 5 ms , duty cycle < 2%

DYNAMIC ELECTRICAL CHARACTERISTICS

TURN-OFF SWITCHING (see Fig. 3)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
t_{rr}	Reverse Recovery Time	Tj = 25°C I_F = 0.5 A I_R = 1A Irr = 0.25A I_F = 1 A dI_F/dt =-50A/µs V_R = 30V		20	 50	ns
I_{RM}	Maximum Recovery Current	Tj = 125°C VR = 400V I_F = 2A dI_F/dt = -16 A/µs dI_F/dt = -50 A/µs		 2.0	1.2	A
S factor	Softness factor	Tj = 125°C V_R = 400V I_F = 2A dI_F/dt = -50 A/µs		TBD		/

TURN-ON SWITCHING (see Fig.8)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
t_{fr}	Forward Recovery Time	Tj = 25°C I_F = 1 A dI_F/dt = 8 A/µs measured at, 1.1 × V_F max			500	ns
V_{Fp}	Peak Forward Voltage				10	V

APPLICATION DATA

The TURBOSWITCH™ "A" is especially designed to provide the lowest overall power losses in any "Freewheel Mode" application (see fig. 1) considering both the diode and the companion transistor, thus optimizing the overall performance in the end application.

The way of calculating the power losses is given below :

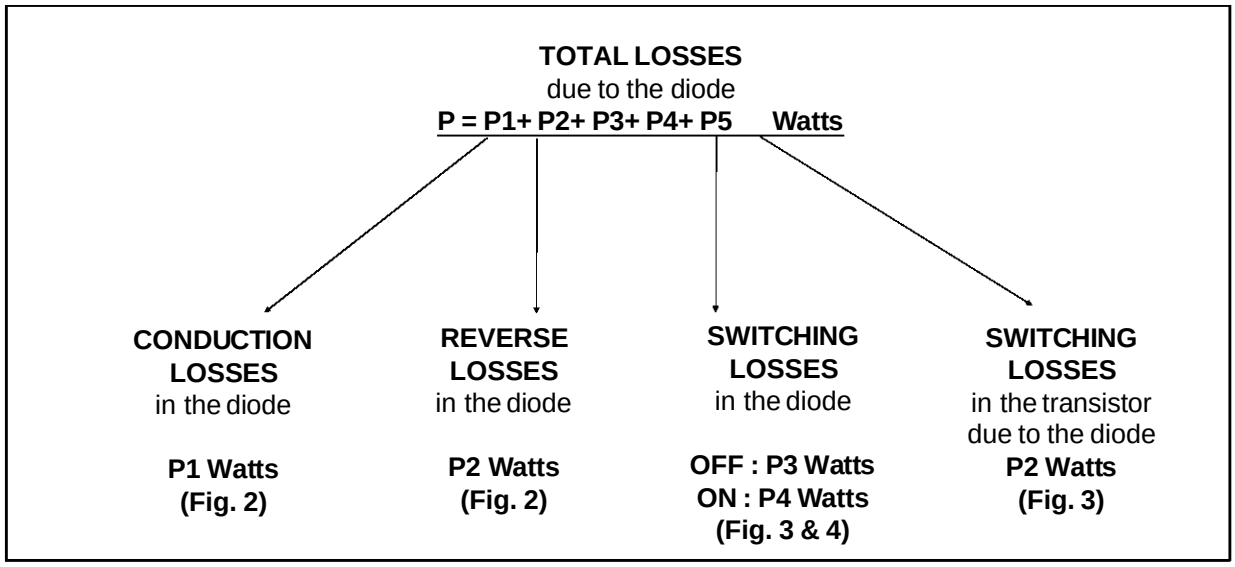
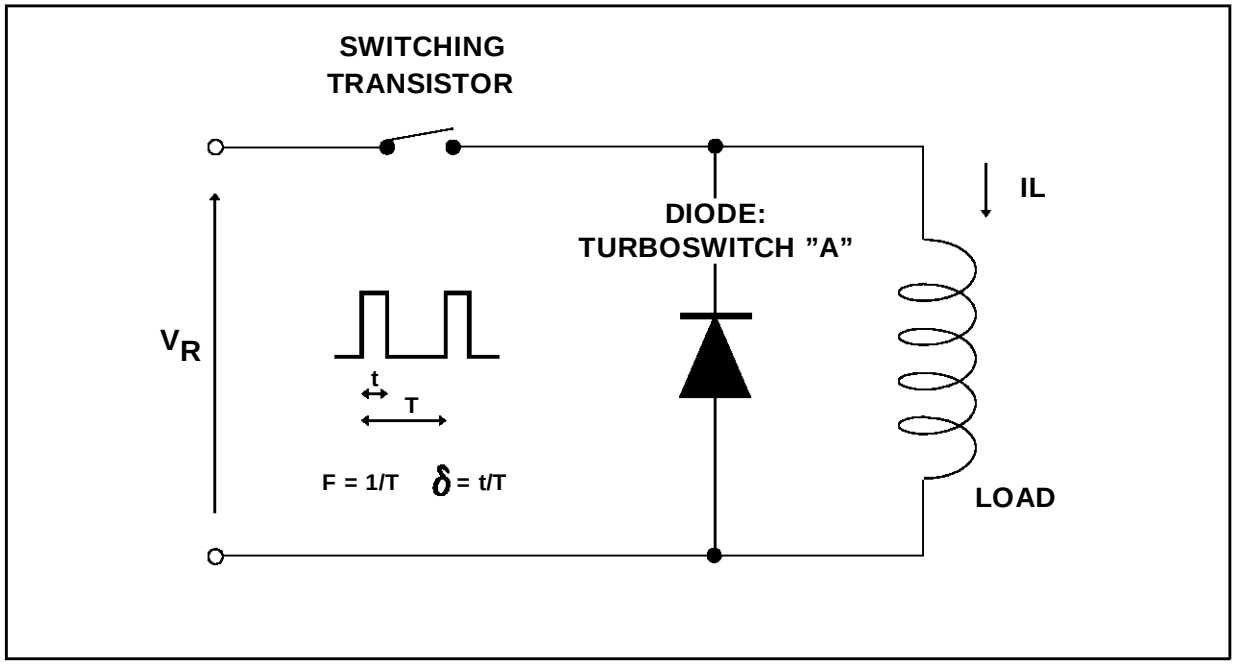
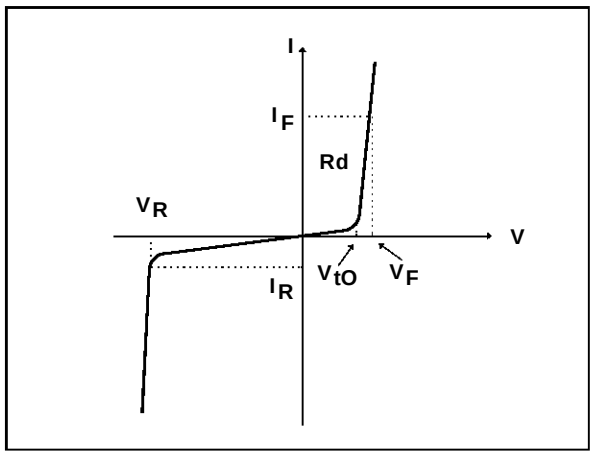


Fig. 1 : "FREEWHEEL" MODE



APPLICATION DATA (Cont'd)

Fig. 2 : STATIC CHARACTERISTICS



Conduction losses :

$P1 = V_{t0} \times I_{F(AV)} + R_d \times I_F{}^2{}_{(RMS)}$

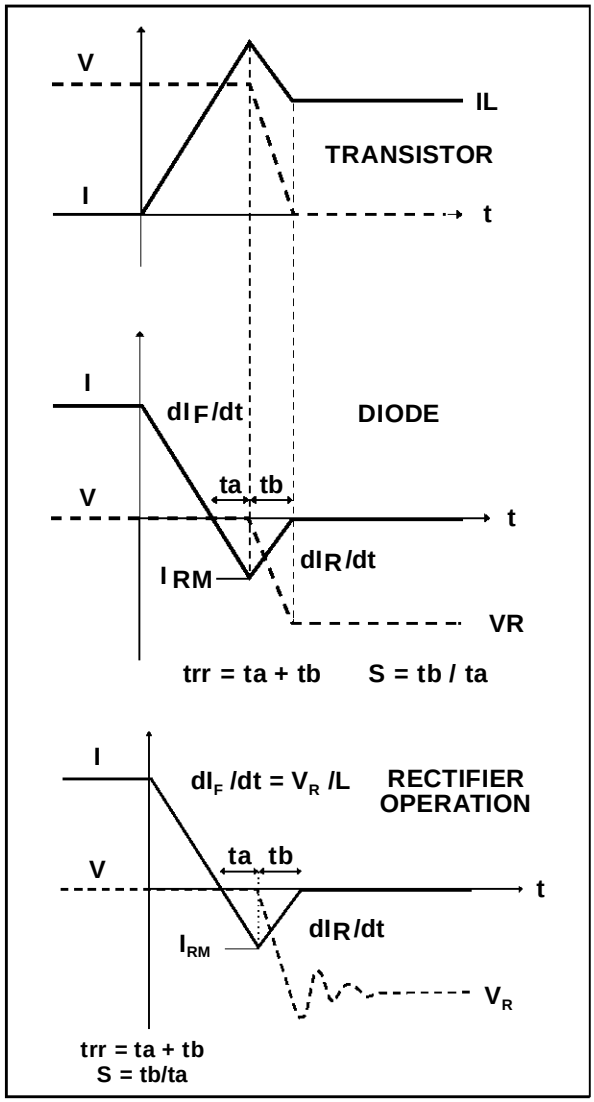
with

$V_{t0} = 1.15$ V
$R_d = 0.175$ Ohm
(Max values at 125°C)

Reverse losses :

$P2 = V_R \times I_{R\ x\ (1 - \delta)}$

Fig. 3 : TURN-OFF CHARACTERISTICS



Turn-on losses :
(in the transistor, due to the diode)

$$P5 = \frac{V_R \times I_{RM}{}^2 \times (3 + 2 \times S) \times F}{6\ x\ dI_F/dt} + \frac{V_R \times I_{RM} \times I_L \times (S + 2) \times F}{2 \times dI_F/dt}$$

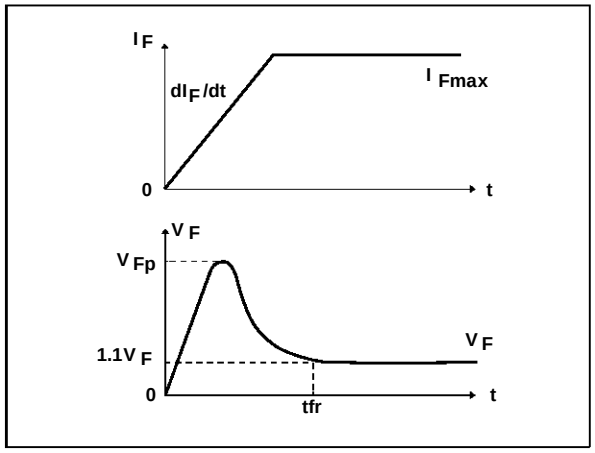
Turn-off losses (in the diode) :

$$P3 = \frac{V_R \times I_{RM}{}^2 \times S \times F}{6\ x\ dI_F/dt}$$

P3 and P5 are suitable for power MOSFET and IGBT

APPLICATION DATA (Cont'd)

Fig. 4 : TURN-ON CHARACTERISTICS



Ratings and characteristics curves are ON GOING.

Turn-on losses :

$P4 = 0.4\ (V_{FP} - V_F) \times I_{Fmax} \times t_{fr} \times F$

PACKAGE MECHANICAL DATA

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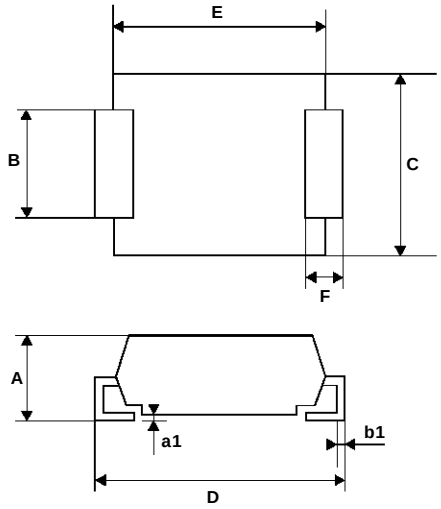

REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.50	3.10	0.098	0.122
a1	0.05	0.20	0.002	0.008
B	2.90	3.10	0.114	0.122
b1	0.29	0.32	0.011	0.012
C	4.80	5.20	0.189	0.204
D	7.60	8.00	0.299	0.315
E	6.30	6.60	0.225	0.259
F	1.30	1.70	0.051	0.056

FOOTPRINT DIMENSIONS

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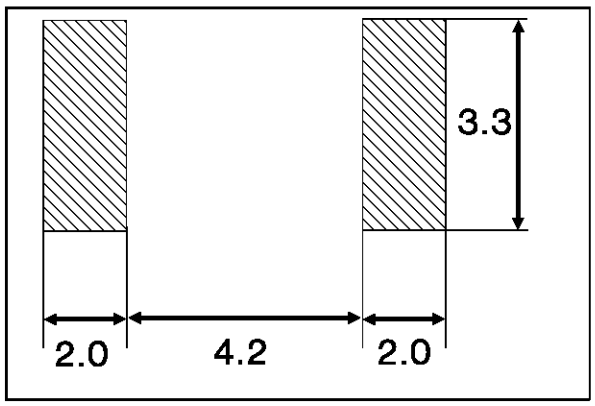

Marking : T51

Laser marking

Logo indicates cathode